UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Group: Attorney Docket # 1898

Applicant(s) : WILLIGES, M.

Serial No. :

Filed :

For : COOLANT CIRCUIT

SIMULTANEOUS AMENDMENT

November 29, 2001

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R S:

Simultaneously with filing of the above identified application please amend the same as follows:

In the Claims:

Cancel all claims without prejudice.

Substitute the claims attached hereto.

REMARKS:

This Amendment is submitted simultaneously with filing of the above identified application.

With the present Amendment applicant has amended the claims so as to eliminate their multiple dependency.

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,

Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

Claims

1. A coolant circuit (10) with at least one heat source (12), a radiator (14), and a bypass line (22), which connects a radiator inlet (18) to a radiator return (20) and whose junction (24) has a control valve (26) disposed in it, whose throttle body (58) can be electrically triggered as a function of operating parameters and environmental parameters by means of at least one control unit (40, 42) and divides the coolant flow between the radiator inlet (18) and the bypass line (22), characterized in that according to a characteristic curve of the control valve (26), the control unit (40, 42) determines a set-point value (50) for the position of the throttle body (58), which sets a ratio of the radiator volume flow to the total coolant flow at the control valve (26) which equals the ratio between the difference of a temperature at the outlet (36) of the bypass line (22) minus a set-point temperature at the inlet of the heat source (12) and the difference of the temperature at the outlet (36) of the bypass line (22) minus a temperature at the outlet of the radiator (14), where the ratio of the radiator volume flow to the total coolant flow is set equal to zero when there is a negative value and is limited to one when there is a value greater than one.

2. The coolant circuit (10) according to claim 1, characterized in that the throttle body (58) is embodied as a valve tap, has at least one distributor conduit (72) passing through it, and can be moved around a rotation axis (64) by a drive mechanism (44).

3. The coolant circuit (10) according to claim 2, characterized in that the throttle body (58) has a spherical surface and an internal distributor conduit (72), which extends lateral to a rotation axis (64) and is open at one circumference surface (82) essentially parallel to the rotation axis (64), while the opposite circumference surface (84) is closed.

4. The coolant circuit (10) according to [one of claims 2 or 3] claim 2, characterized in that the throttle body (58) is supported in a valve body (60) that has a temperature sensor (32), which protrudes into the distributor conduit (72) in the vicinity of the rotation axis (64).

5. The coolant circuit (10) according to [one of the preceding claims] claim 1, characterized in that the first control unit (40) generates the set-point value (50) for the position of the throttle body (58) and the second electronic control unit (42), which is integrated into the control valve (26), processes this set-point value, along with a detected actual value (52) of the position of the throttle body (58) to produce a correcting variable for the position of the throttle body (58).

6. The coolant circuit (10) according to claim 5, characterized in that at least one of the control units (40, 42) can be programmed for different valve characteristic curves.

7. The coolant circuit (10) according to [one of the preceding claims] claim 1, characterized in that at least one of the control units (40, 42) has a malfunction detection and in the event of a malfunction of the first control unit (40), switches to an emergency operation in which the second control unit (42) receives control signals from additional sensors.

8. The coolant circuit (10) according to [one of the preceding claims] claim 1, characterized in that the control is subordinate to a regulation as a function of a temperature at the inlet of the heat source (12).

9. The coolant circuit (10) according to claim 8, characterized in that the correcting variable of the regulating device is limited to a part of the adjustment path of the throttle body (58).

10. The coolant circuit (10) according to claim 8 [or 9], characterized in that the regulating device is a gain-scheduling P regulator.

11. The coolant circuit (10) according to claim 9 [or 10], characterized in that the regulating device monitors the proper functioning of the control valve (26).

12. The coolant circuit (10) according to [one of the preceding claims] claim 1, characterized in that a number of heat sources (12) and/or heat sinks (14) are provided.

13. The coolant circuit (10) according to [one of the preceding claims] claim 1, characterized in that instead of using the temperature at the outlet (36) of the bypass line (22), the temperature downstream of the heat source (12) and/or at the junction (24) of the bypass line (22) is used for the control.

Claims

1. A coolant circuit (10) with at least one heat source (12), a radiator (14), and a bypass line (22), which connects a radiator inlet (18) to a radiator return (20) and whose junction (24) has a control valve (26) disposed in it, whose throttle body (58) can be electrically triggered as a function of operating parameters and environmental parameters by means of at least one control unit (40, 42) and divides the coolant flow between the radiator inlet (18) and the bypass line (22), characterized in that according to a characteristic curve of the control valve (26), the control unit (40, 42) determines a set-point value (50) for the position of the throttle body (58), which sets a ratio of the radiator volume flow to the total coolant flow at the control valve (26) which equals the ratio between the difference of a temperature at the outlet (36) of the bypass line (22) minus a set-point temperature at the inlet of the heat source (12) and the difference of the temperature at the outlet (36) of the bypass line (22) minus a temperature at the outlet of the radiator (14), where the ratio of the radiator volume flow to the total coolant flow is set equal to zero when there is a negative value and is limited to one when there is a value greater than one.

2. The coolant circuit (10) according to claim 1, characterized in that the throttle body (58) is embodied as a valve tap, has at least one distributor conduit (72) passing through it, and can be moved around a rotation axis (64) by a drive mechanism (44).

3. The coolant circuit (10) according to claim 2, characterized in that the throttle body (58) has a spherical surface and an internal distributor conduit (72), which extends lateral to a rotation axis (64) and is open at one circumference surface (82) essentially parallel to the rotation axis (64), while the opposite circumference surface (84) is closed.

4. The coolant circuit (10) according to claim 2, characterized in that the throttle body (58) is supported in a valve body (60) that has a temperature sensor (32), which protrudes into the distributor conduit (72) in the vicinity of the rotation axis (64).

5. The coolant circuit (10) according to claim 1, characterized in that the first control unit (40) generates the set-point value (50) for the position of the throttle body (58) and the second electronic control unit (42), which is integrated into the control valve (26), processes this set-point value, along with a detected actual value (52) of the position of the throttle body (58) to produce a correcting variable for the position of the throttle body (58).

6. The coolant circuit (10) according to claim 5, characterized in that at least one of the control units (40, 42) can be programmed for different valve characteristic curves.

7. The coolant circuit (10) according to claim 1, characterized in that at least one of the control units (40, 42) has a malfunction detection and in the event of a malfunction of the first control unit (40), switches to an emergency operation in which the second control unit (42) receives control signals from additional sensors.

8. The coolant circuit (10) according to claim 1, characterized in that the control is subordinate to a regulation as a function of a temperature at the inlet of the heat source (12).

9. The coolant circuit (10) according to claim 8, characterized in that the correcting variable of the regulating device is limited to a part of the adjustment path of the throttle body (58).

10. The coolant circuit (10) according to claim 8, characterized in that the regulating device is a gain-scheduling P regulator.

11. The coolant circuit (10) according to claim 9, characterized in that the regulating device monitors the proper functioning of the control valve (26).

12. The coolant circuit (10) according to claim 1, characterized in that a number of heat sources (12) and/or heat sinks (14) are provided.

13. The coolant circuit (10) according to claim 1, characterized in that instead of using the temperature at the outlet (36) of the bypass line (22), the temperature downstream of the heat source (12) and/or at the junction (24) of the bypass line (22) is used for the control.